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Functional specifications for the PXIE LEBT switching dipole

The Low Energy Beam Transport (LEBT) of the Project X Injector Experiment (PXIE) will prepare a 30 keV, 5 mA DC H- beam for injection into the RFQ. For redundancy, the beam can be generated in one of two ion sources. Selection between the sources is provided by changing polarity of the magnetic field in a switching dipole magnet, which parameters are listed below. Dimensions indicated by letters refer to the figure at the end of the document.

Parameter	Value	Units	Comments
Bending angle, α	30	deg	
Input edge angle, E	15	deg	The part of the pole tip that determines the edge focusing should removable to allow re-machining if optic requirements change
Minimum pole separation, A	60	mm	
Nominal magnetic field, B_0	0.083	T	At 90% of the peak current
Effective bending radius, $R_0 = \frac{1}{\alpha}\frac{\int B_y ds}{B_0}$	300	mm	
Good field aperture (diameter)	>25	mm	Around each of two possible trajectories
Field quality, $\left\lvert 1-\frac{\int B_y(x,y,s)ds}{B_0\alpha(R_0+\frac{x}{2})}\right\rvert$	≤0.3%		Field integral error within good field aperture; B_0 is nominal field on axis; x-radial displacement from axis, y-vertical displacement from axis
Peak coil current	≤ 300	A	For each polarity
Power dissipation at the peak current	≤ 3	kW	
Physical constrains: Total length, B Total width, C Width (yoke), D	 ≤ 230 ≤ 300 ≤ 200	 mm mm mm	Dimensions C and D are to show the preference and can be modified by mutual agreement

For a beam trajectory from each ion source, the magnet should be equivalent to a sector dipole with the indicated edge focusing at the entrance in the approximation of hard edges.

The magnet should be dismountable for installation of the vacuum chamber.

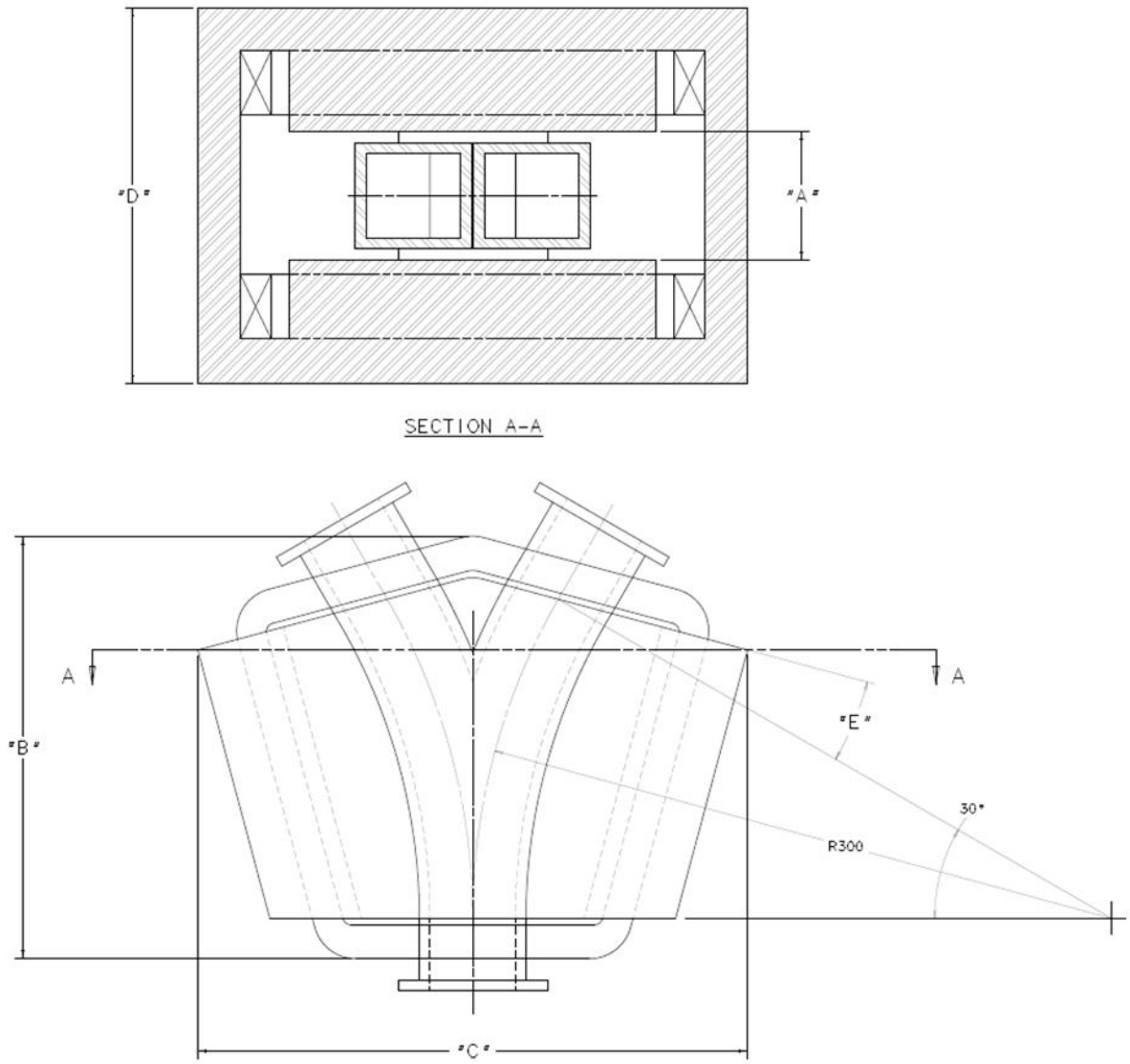

Figure. Schematic of the switching dipole.